SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-40

Name: Swan Lake **County**: Turner
Legal Description: T97N-R53W-Sec 15-16
Location from nearest town: 3 miles north and 1 mile west of Viborg, SD

Dates of present survey: August 22-23, 2007
Dates of last survey: August 22-23, 2005

Primary Game and Forage Species	Other Species
Walleye	Northern Pike
Yellow Perch	Black Bullhead
Black Crappie	White Sucker
	Common Carp
	Shorthead Redhorse
	Green Sunfish
	Bigmouth Buffalo
	Channel Catfish

PHYSICAL DATA

Surface area: 208 acres **Watershed area**: 81,913 acres
Maximum depth: 6 feet **Mean depth**: 3 feet
Volume: 719 acre-feet **Shoreline length**: 3.8 miles
Contour map available: Yes **Date mapped**: 1985
OHWM elevation: 1252.9 **Date set**: April, 1983
Outlet elevation: 1252.4 **Date set**: April, 1983
Lake elevation observed during the survey: Full
Benificial use classifications: (5) warmwater semipermanent fish life propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Introduction

Swan Lake, a shallow, marginal lake located near the town of Viborg, was so named because it is supposedly shaped like a swan. The lake receives heavy use because of it's proximity to Sioux Falls and the number of people living around it. Throughout history, the lake has been plagued with heavy nutrient and sediment loading from the watershed. Compounding the problem was a poorly-designed water diversion system that directed untreated water from Turkey Ridge Creek into the lake to maintain water levels. From 1992-1998, the diversion was closed, erodable shorelines were riprapped and over 400,000 cubic yards of sediment were dredged from the basin. A prolonged period of drought with subsequent declines in lake levels prompted the redesign and construction of a new diversion structure accompanied by an operating plan that only allows diversion of high-quality water in the fall and winter. This new system has restored lake levels.

Ownership of Lake and Adjacent Lakeshore Properties

Swan Lake is listed as a meandered public water in the State of South Dakota Listing of Meandered Lakes. The South Dakota Department of Game, Fish, and Parks (GFP) owns and maintains an access area on the south shore of the lake. The remaining lakeshore property is privately owned and heavily developed.

Fishing Access

The Swan Lake Access Area contains a boat ramp with a dock. The north shore of the lake contains several shore fishing areas.

Field Observations of Water Quality and Aquatic Vegetation

Some cattails were present along the west shore. No submergent vegetation was observed.

BIOLOGICAL DATA

Methods:

Swan Lake was sampled on August 22-23, 2007 with three overnight gill-net sets and four overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh (¾ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh (½, ¾, 1, 1¼, 1½, and 2 in) monofilament netting. Sampling locations are displayed in Figure 3.

Results and Discussion:

Gill Net Catch

Bigmouth buffalo (25.6%), black bullhead (22.1%), walleye (14.0%), and channel catfish (12.8) were the most common species sampled in the gill nets (Table 1). Other species sampled included common carp, white crappie, black crappie, white sucker, and yellow perch.

Table 1. Total catch from three overnight gill net sets at Swan Lake, Turner County, August 22-23, 2007.

Species	Number	Percent	CPUE[1]	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Bigmouth Buffalo	22	25.6	7.3	±2.4	11.9	0	0	83
Black Bullhead	19	22.1	6.3	±4.2	22.6	11	0	88
Walleye	12	14.0	4.0	±2.7	2.2	0	0	79
Channel Catfish	11	12.8	3.7	±0.4	1.2	0	0	87
Common Carp	8	9.3	2.7	±1.1	5.6	--	--	--
White Crappie	7	8.1	2.3	±0.4	0.6	--	--	--
Black Crappie	3	3.5	1.0	±0.7	0.0	--	--	--
White Sucker	3	3.5	1.0	±0.7	0.2	--	--	--
Yellow Perch	1	1.2	0.3	±0.4	28.2	--	--	--

* 5 years (1998, 1999, 2001,2003, 2005)

Trap Net Catch

Black crappies (40.1%), black bullheads (17.2%), and white crappies (13.7) made up the majority of the trap net sample (Table 2). Other species included walleye, common carp, bigmouth buffalo, white sucker, green sunfish, bluegill, shortnose gar, channel catfish, and yellow perch were also sampled.

Table 2. Total catch from four overnight trap net sets at Swan Lake, Turner County, August 22-23, 2007.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Crappie	91	40.1	22.8	±8.2	0.0	81	1	96
Black Bullhead	39	17.2	9.8	±6.1	69.7	18	0	83
White Crappie	31	13.7	7.8	±2.8	0.3	71	6	98
Walleye	22	9.7	5.5	±2.7	0.8	5	5	80
Common Carp	16	7.0	4.0	±1.4	3.3	87	40	79
Bigmouth Buffalo	9	4.0	2.3	±1.3	1.8	--	--	--
White Sucker	9	4.0	2.3	±1.7	2.9	--	--	--
Green Sunfish	4	1.8	1.0	±0.9	11.5	--	--	--
Bluegill	2	0.9	0.5	±0.6	0.0	--	--	--
Shortnose Gar	2	0.9	0.5	±0.6	0.0	--	--	--
Channel Catfish	1	0.4	0.3	±0.3	1.0	--	--	--
Yellow Perch	1	0.4	0.3	±0.3	4.9	--	--	--

* 5 years (1998, 1999, 2001, 2003, 2005)

[1] See Appendix A for definitions of CPUE, PSD, and mean Wr.

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 15.

Swan Lake has a low-density walleye population (Table 1) and only yearlings from the 2006 year class were sampled. These fish ranged in length from 19 to 26 cm (7.4-10.2 in) and most likely originated from the 2006 fingerling stocking (Table 4).

All Species

Swan Lake has a diverse fish community with 12 species sampled this year (Table 3). CPUE was low for many species. The black crappie trap net catch increased to a 10-year high after the 2006 adult fish stocking. White crappie numbers also increased, and together, both species provided some ice fishing opportunity this winter. Additional fish stocking will be done to further improve game fish and panfish populations.

Table 3. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Swan Lake, Turner County, 1998-2007.

Species	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
SHG (GN)	--	--		--		--		--		--
SHG (TN)	--	--		--		--		0.2		0.5
COC (GN)	16.0	6.3		4.0		0.3		1.5		2.7
COC (TN)	8.6	4.2		1.1		0.6		2.0		4.0
RIC (GN)	--	--		--		--		--		--
RIC (TN)	--	--		--		0.1		--		--
WHS (GN)	--	0.7		0.3		--		--		1.0
WHS (TN)	10.6	2.8		1.0		0.4		--		2.3
BIB (GN)	0.7	0.3		20.0		23.3		15.0		7.3
BIB (TN)	1.6	0.4		3.9		2.6		0.4		2.3
SHR (GN)	0.3	--		--		--		--		--
SHR (TN)	--	--		0.1		--		--		--
BLB (GN)	29.0	35.3		16.7		22.0		10.0		6.3
BLB (TN)	138.6	102.2		37.3		55.4		14.8		9.8
CCF (GN)	--	--		0.3		1.0		4.5		3.7
CCF (TN)	2.0	0.2		0.3		1.6		1.0		0.3
NOP (GN)	--	--		--		--		--		--
NOP (TN)	0.6	--		--		--		--		--
GSF (GN)	2.0	30.7		--		--		--		--
GSF (TN)	7.2	49.8		0.3		--		--		1.0
OSF (GN)	--	--		--		--		--		--
OSF (TN)	4.0	1.8		0.9		--		--		--
BLG (GN)	--	--		--		--		--		--
BLG (TN)	--	--		--		--		--		0.5
WHC (GN)	--	--		--		1.3		1.5		2.3
WHC (TN)	--	--		--		--		1.4		7.8
BLC (GN)	--	--		--		--		--		1.0
BLC (TN)	0.4	--		--		--		--		22.8
YEP (GN)	72.0	58.7		9.0		1.0		0.5		0.3
YEP (TN)	16.6	6.4		1.2		--		0.4		0.3
SXW (GN)	--	46.0		17.3		1.7		--		--
SXW (TN)	--	3.0		3.8		4.1		0.4		--
WAE (GN)	--	--		--		6.7		4.5		4.0
WAE (TN)	--	--		--		3.7		0.4		5.5

SHG (Shortnose Gar), COC (Common Carp), RIC (River Carpsucker), WHS (White Sucker), BIB (Bigmouth Buffalo), SHR (Shorthead Redhorse), BLB (Black Bullhead), CCF (Channel Catfish), NOP (Northern Pike), GSF (Green Sunfish), OSF (Orange-spotted Sunfish), BLG (Bluegill), WHC (White Crappie), BLC (Black Crappie), YEP (Yellow Perch), SXW (Saugeye), WAE (Walleye)

MANAGEMENT RECOMMENDATIONS

1. Continue to monitor the Swan Lake fishery by conducting biennial netting surveys.

2. Now that the rebuilt diversion system will maintain water levels, stock walleye fry or fingerlings, yellow perch adults or fingerlings, black crappie adults and channel catfish adults to improve the fishery.

3. Develop an aquatic habitat improvement plan for the lake that may include artificial structures, aquatic plant restoration and rough fish management.

Table 4. Stocking record for Swan Lake, Turner County, 1991-2007.

Year	Number	Species	Size
1991	20,000	Walleye	Sml. Fingerling
1992	18,000	Channel Catfish	Fingerling
1998	1,568	Saugeye	Juvenile
1999	165,600	Saugeye	Fry
2000	25,000	Saugeye	Fingerling
2002	25,000	Walleye	Fingerling
	9,196	Yellow Perch	Juvenile
2005	5,984	Walleye	Fingerling
2006	4,892	Black Crappie	Adult
	18,265	Walleye	Fingerling
	3,960	Yellow Perch	Juvenile

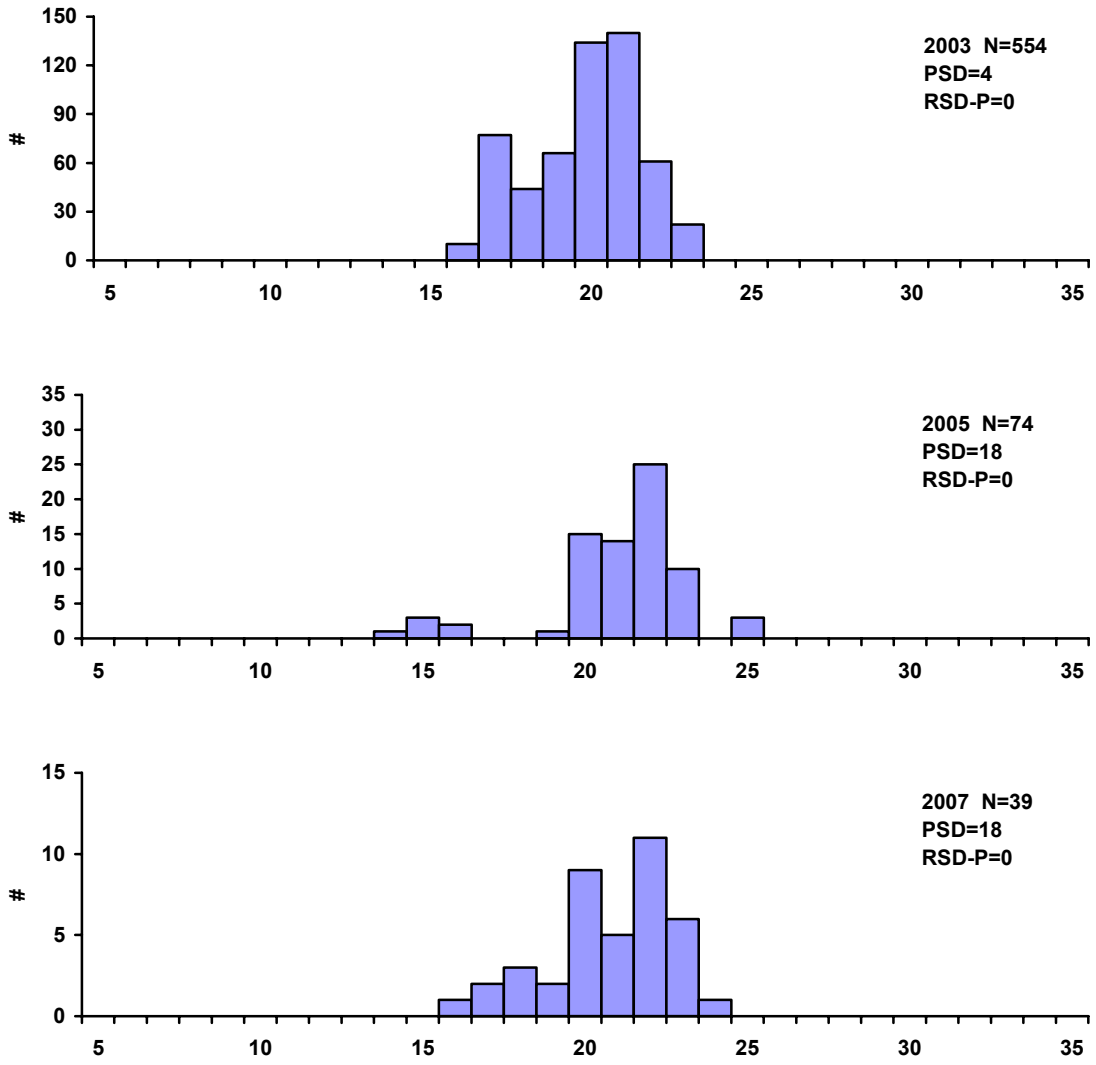

Figure 1. Length frequency histograms for black bullheads sampled with trap nets in Swan Lake, Turner County, 2003, 2005 and 2007.

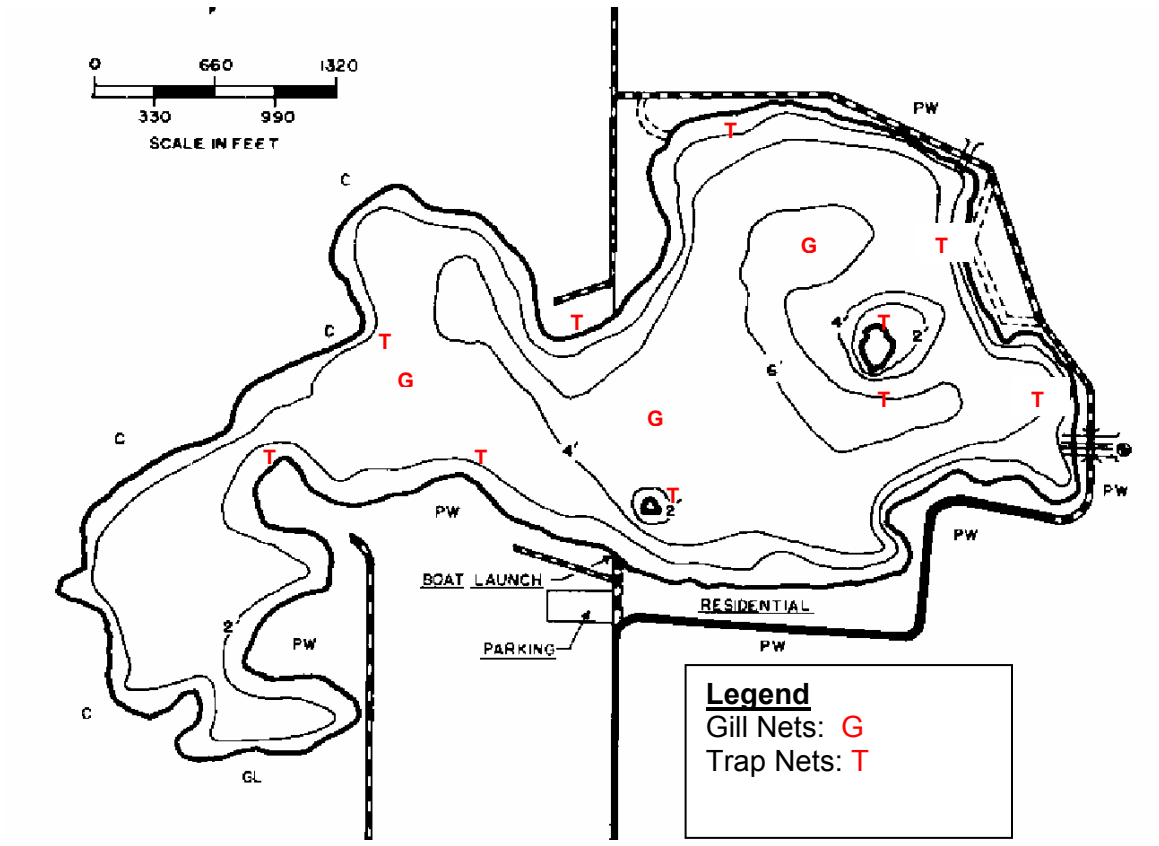

Figure 3. Sampling locations on Swan Lake, Turner County, 2007.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$PSD = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$RSD\text{-}P = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.